UPS System
Power Modular
Concept

PMC 12
1, 2 and 3kVA

PMC12 compact
2 and 3kVA

7857.430
7857.431
7857.432
7857.482
7857.483

Assembly and Operation Instructions

FRIEDHELM LOH GROUP

RITTAL

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1. Important Safety Instruction

1.1. Documentation Notes

The audience for this guide is the technical specialist familiar with the assembly, installation and operation of the PMC12 UPS-System.
You should read this operating guide prior to commissioning and store the guide so it is readily accessible for subsequent use.
Rittal cannot accept any liability for damage and operational malfunctions that result from the non observance of this guide.

1.2. Retention of the Documents

This guide and all associated documents are part of the product. They must be given to the operator of the unit and must be stored so they are available when needed.

1.3. Used Symbols

The following safety and other notes are used in this guide:

Symbol for handling instructions:

- This bullet point indicates that you should perform an action.

Safety and other notes:

Danger!
Immediate danger to health and life!

Warning!
Possible danger for the product and the environment!

Note!
Useful information and special features.

1.4. Safety Instructions

1. Assembly and installation of the UPS, in particular for wiring the enclosures with mains power, may be performed only by a trained electrician. Other tasks associated with the UPS, such as the assembly and installation of system components with tested standard connectors, and the operation and configuration of the PMC12 UPS-System may be performed only by instructed personnel.
2. Observe the valid regulations for the electrical installation for the country in which the unit is installed and operated, and the national regulations for accident prevention. Also observe any company-internal regulations (work, operating and safety regulations).
3. Do not open the case, as there are no serviceable parts inside. Your warranty will be void.
4. Do not try to repair the unit yourself; contact your local supplier or your warranty will be void.
5. If liquids are spilt onto the UPS or foreign objects dropped into the unit, the warranty will be null and void.
6. Do not install the UPS in an environment with sparks, smoke or gas.
7. This UPS is equipped with an EMI filter. To prevent potential leakage current hazard, ensure that the AC main supply is securely grounded.
8. This UPS is designed to be installed and commissioned in a sheltered, controlled environment as follows:
    - Operating temperature 0-40°C and 30-90% non-condensing humidity.
    - Always avoid contact with direct sunlight.
    - Do not install the UPS in inflammable or hazardous environment.
    - Dusty, corrosive and salty environments can do damage to any UPS.
    - Install the UPS indoors as it is not designed for installation outdoors.
9. To prevent any overheating of the UPS, keep all ventilation openings free from obstruction, and do not place anything on top of the UPS. Keep the UPS rear panel 20 cm away from the wall or other obstructions.
10. The battery will discharge naturally if the system is unused for any length of time.
11. Install the UPS away from objects that give off excessive heat and areas that are excessively wet.
12. Always switch off the UPS and disconnect the batteries when relocating the UPS.
13. It should be recharged every 2-3 months if unused. If this is not done, then the warranty will be null and void.

When installed and being used, the batteries will be automatically recharged and kept in top condition.

14. Make sure that the AC Utility outlet is correctly grounded.
15. Please ensure that the input voltage of the UPS matches the utility supply voltage. Use a certified input power cable with the correct plugs and sockets for the appropriate voltage system.
16. Use only genuine or recommended parts and accessories. The use of other parts can void the liability for any resulting consequences.

1.5. Proper Use

This UPS is designed for providing power to IT systems. A use different from that described here is considered to be an improper use. Rittal cannot accept any liability for damage resulting from the improper use or the non-observance of this guide. The guides for the used accessories may apply.

Rittal prohibits the use for life-preserving applications (such as the use in hospitals or the direct patient care). Rittal expressly does not sell its products for such applications. Rittal will not accept any responsibility if a UPS is used in this area.

1.6. Storage Instructions

For extended storage in moderate climate, the batteries should be charged for 12 hours at 3 month intervals by connecting the UPS to the utility supply and switch on input breaker located at UPS rear panel. Repeat this procedure every 2 months if the storage ambient temperature is above 30°C.

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2. Product Introduction

2.1. General Characteristics

True online technology continuously supplies your critical device with stable, regulated, transient-free pure sine wave AC Power.

1. High-efficiency 20 kHz PWM sine-wave topology yields an excellent overall performance. The high crest factor of the inverter handles all high in-rush current loads without the need to upgrade the power rating.
2. A fully digitalised control circuit provides a high level of protection and enables future upgrade. In-built communication capability enhances its ability for remote control and monitoring.
3. The multi-functional LCD panel will display various status of the UPS. The LCD display may show Input/Output Voltage, Frequency, Load Status, Inner cabinet temperature, and Abnormal Phenomenon.
4. Should the output become short-circuited, the UPS holds the system and cuts the output automatically till the short circuit situation is removed manually.
5. Should the unit become overheated, the internal thermal switch will detect the heat and switch to bypass mode and vice versa.
6. Maintenance-free sealed-type battery minimises after-sales service.
7. The maintenance bypass switch provides easy and safe troubleshooting or maintenance function when the utility is normal.
8. User-friendly plug-and-play guarantees a simple installation. As standard, all systems up to 3 kVA are supplied with power supply cable and output connections.
9. To protect the system against overload, the UPS is switched automatically within 30 seconds to bypass operation when the loading reaches a value of 105% ~ 120% of the rated loading. The system is automatically switched back into converter operation when the overload state no longer exists.

2.2. Special Features

High Frequency Transformer-less technology with rack/tower convertible enclosure enables the UPS to integrate even in the most difficult of environments with space constraints.

1. This UPS is equipped with fully digitalised control logic for greater functionality and enhanced high level of power protection. Digital signal processing (DSP) also provides the UPS with powerful communication capability, which enhances the flexibility for easy remote control and monitoring
2. Wide input voltage tolerance from 160V~280V allows under-voltage or over-voltage correction without unnecessary battery drain and helps extend the battery life span.
3. The cold start function ensures the start-up of UPS even during power outages. (see Section 4.4.2)
4. Revolutionary battery management circuit analyses battery discharging status to adjust battery cut-off point and extend the batteries' life span.
5. Active Power Factor Correction (PFC) control function constantly maintains the UPS Input Power Factor (PF) at > 0.99 for superb energy efficiency.
6. Fast Selectable Output Voltages (200 / 208 / 220 /230 / 240 V) to meet various voltage systems.
7. Selectable Bypass input voltage tolerance (Sensitivity low/high) to prevent under or over voltage being supply to the loads at Bypass mode. The selectable Voltage ranges are:
   (i) Sensitivity Low: 184~260V &
   (ii) Sensitivity High: 194~260V.
8. Intelligent temperature-controlled fan may not only extend the life span, but also reduce annoying noise because of sudden fan spin. Your office remains quiet and comfortable as usual.
9. When the UPS is out of order, you may read out the possible fault reason from the LCD screen directly, which may reduce downtime.
10. The UPS is designed to comply with various stringent international standards for Electromagnetic Interference & protection (EMC).

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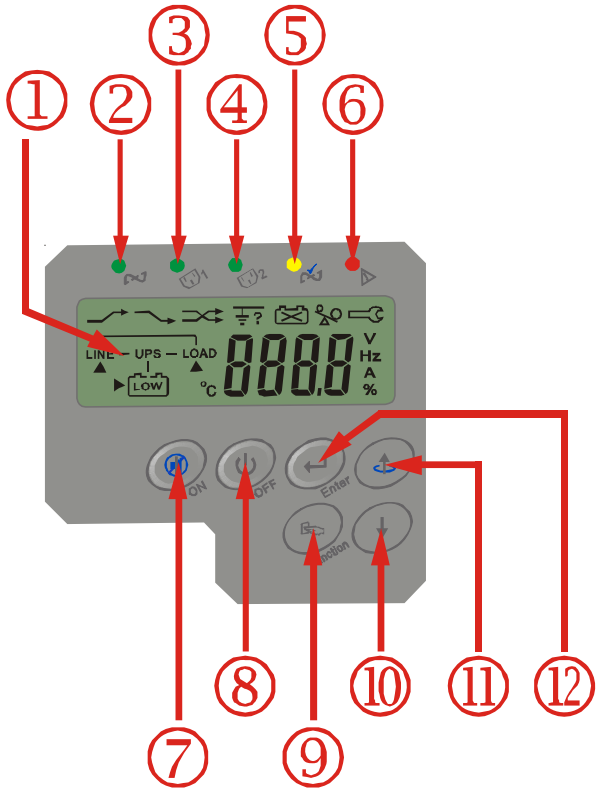
3. UPS Functional Descriptions

3.1. UPS Front Panel Display



① LCD Display

② Green LED steadily lights up to indicate that the Utility input voltage is within the window (160Vac~288Vac).

③, ④Green LED lights up to indicate there is an output available at the Programmable Outlet 1 & Programmable Outlet 2.

⑤ Amber LED lights up to indicate the Bypass Input is normal.

⑥ General Fault LED

⑦ UPS On/Alarm Silence

⑧ UPS OFF Switch

⑨ Special functions log in/out

⑩ Go to next page

⑪ Go to previous page or change the setting of the UPS.

⑫ To re-confirm the change of UPS Setting

3.1.1. Symbols on the LCD Display Panel

Item	Symbol	Description
1	LINE	Utility or Bypass Source
2	LOW	Battery Low
3		Battery Abnormal
4		UPS Overloading
5		Site Wiring Fault
6		UPS Working in Service Mode
7	OFF	UPS Shutoff
8	FAIL	UPS Abnormal Lock
9	LINE — UPS — LOAD LOW	UPS Flow Chart
10	°C V Hz A %	4 Digits Measurement Display
11	▲ ▶	Indicate the item desired to be measured
12	Er05	Battery Weak or Dead
13	Er06	Output Short Circuit
14	Er10	Inverter Over-current
15	Er11	UPS Overheat
16	Er12	UPS Output Overloading
17	Er**	Other Error Code

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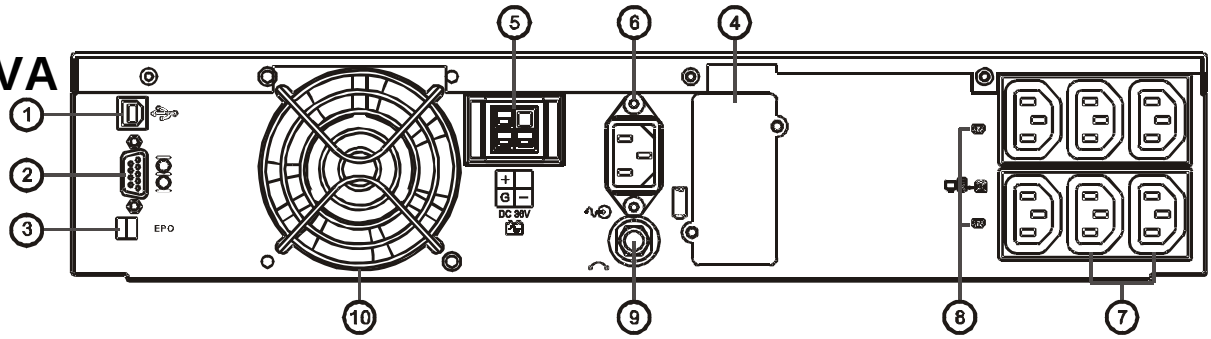
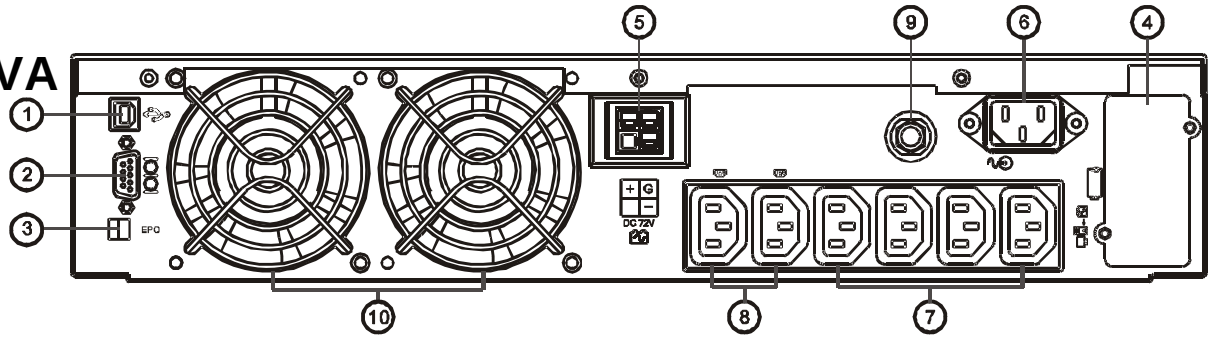
3.2. Rear Panel Description PMC12

230V

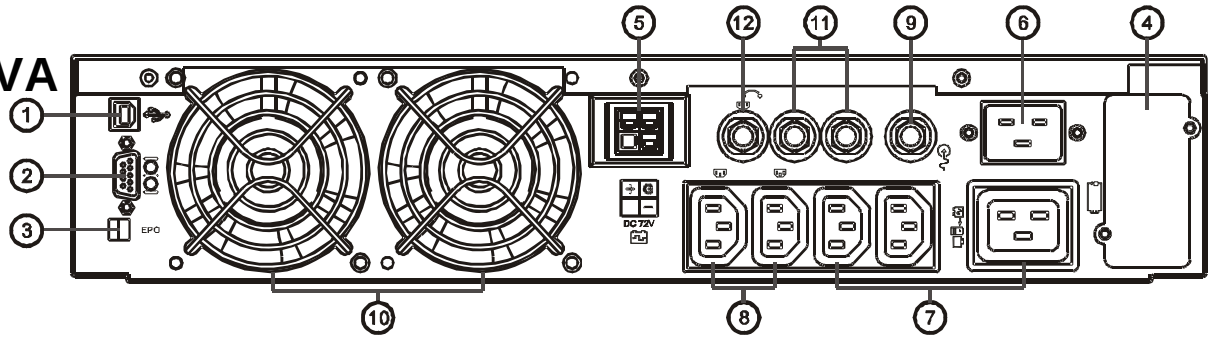
1KVA



2KVA



3KVA



1. USB Port
2. RS232 Port
3. Emergency Power Off (EPO) Dry Contact Signal inputs
4. Communication Card Options Slot
5. External Battery Connector
6. AC power connection socket
7. AC Outlets
8. Two programmable outlets
9. Utility Input fuse holder
10. Cooling Fans
11. Output fuse holders
12. Output fuse holders for two programmable outlets

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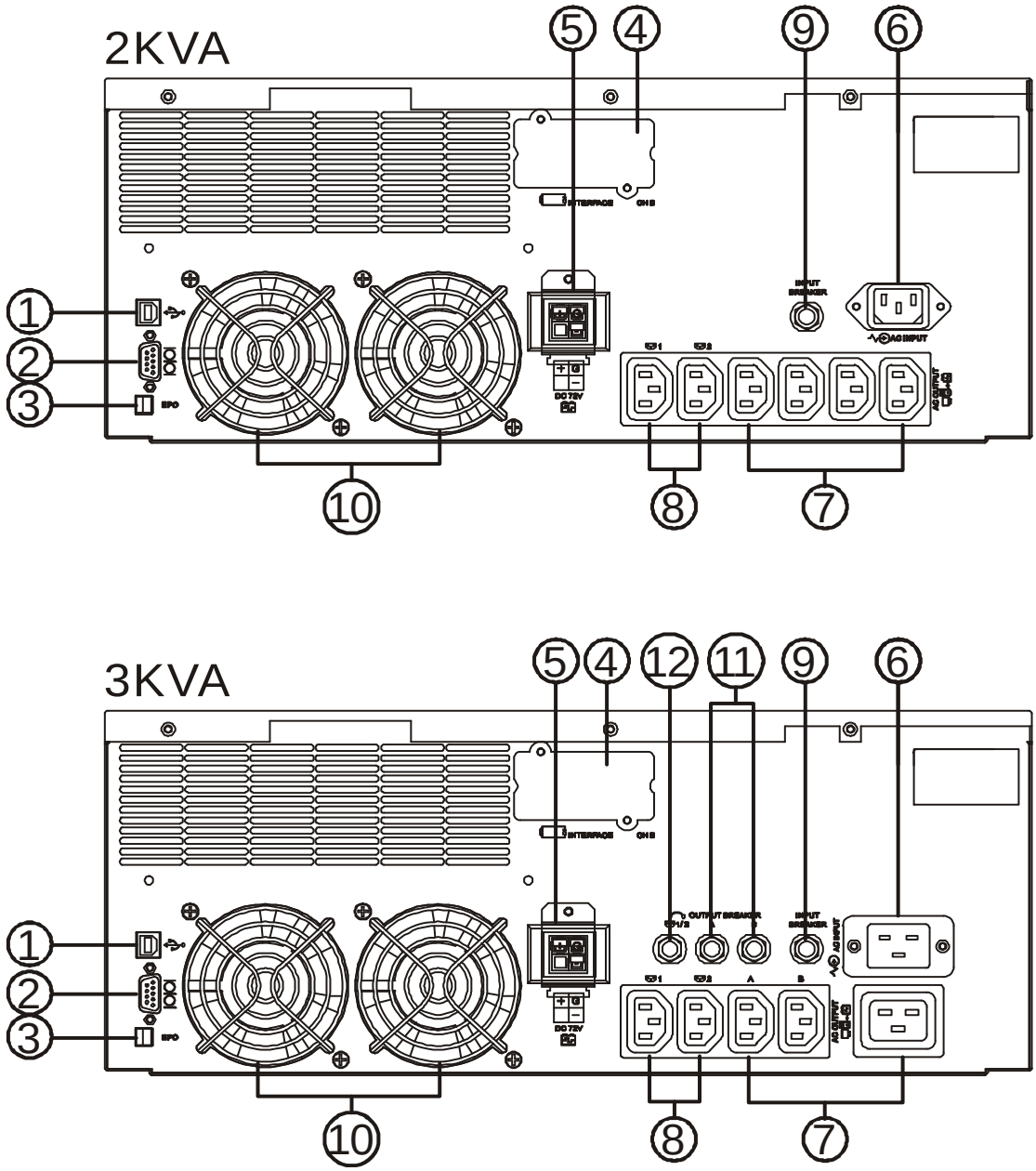
3.3. Rear Panel Description PMC12 compact



1. USB Port
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12. Output fuse holders for two programmable outlets

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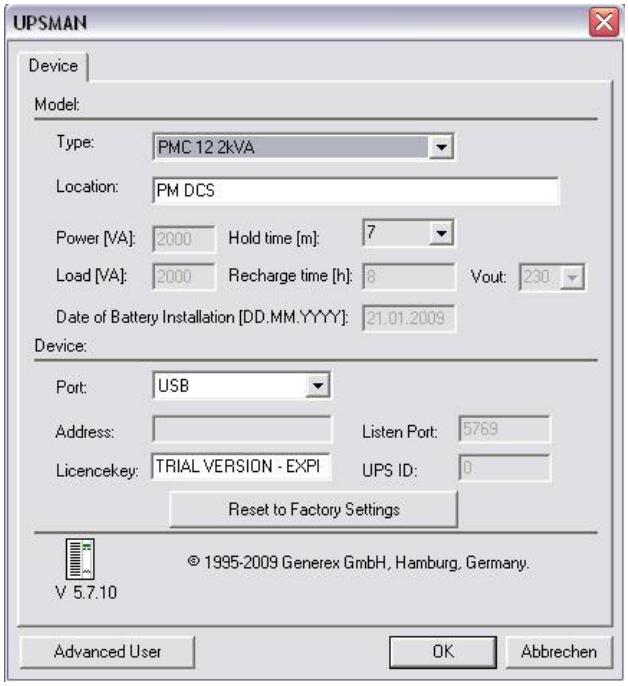
3.4. Operating Modes & UPS Configuration

Install the “Rittal PMC12 UPS-Software“ from the enclosed CD or download it from http://www.rimatrix5.com/service_support/downloads.asp. Run the programm „UPSMan Configuration“. The following Window appears:



3.4.1. System Configuration

1. Select the UPS-type and the number of battery packs you have connected. The data in the lower part of the window will be filled in automatically..
2. Name the location of the UPS
3. Choose the port on which the UPS is connected to your PC. (If you choose „CS122“, you have to write down the IP-address of the UPS-System).
4. If you did not write down a valid licence key during the installation you have the possibility to switch your 30-days trial version into a full-version later, by tipping in a valid key.
5. The button „Advanced User“ allows you to edit the before locked fields of the window. This function should only be used by persons who have detailed knowledge about the UPS-System. Rittal takes no responsibility for system failure which is caused by false data.
6. To save the settings press “OK”. To activate the configuration you have to restart the UPS-System.

3.4.2. Using the Software

1. Run the program „UPSMonitor“
2. Choose the connection on which the UPS is connected to the PC.
3. After the connection was successful the main menu of the program will open. There you have an overview about all parameters of the UPS. The configuration of the UPS is finished.

3.4.3. Configuration of the programmable outlets

The UPS has 2 programmable outlets on which uncritical loads can be connected. These outlets can be switched off and offer therefor a longer power supply to even more critical loads in case of a power fail or overload of the UPS.

Click in the upper side of the window on the button “Functions" → „Device Functions“ and then click in „Extended Cmds“.

Here you can manually switch the two outlets and initiate a restart or switch off the UPS.

The button „Programmable Outlet Settings“ allows you to program the outlets.

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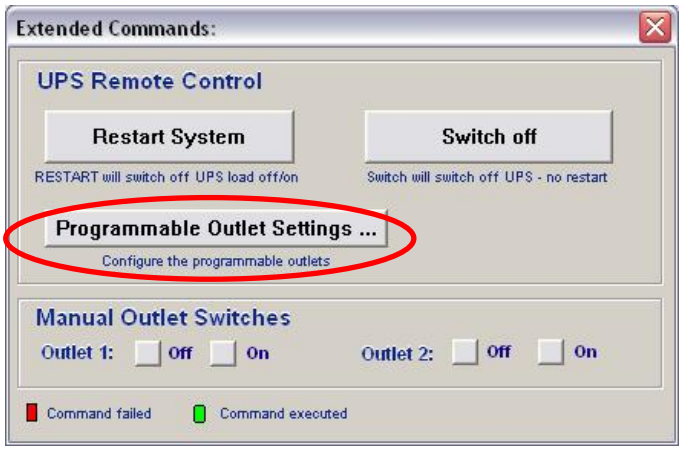
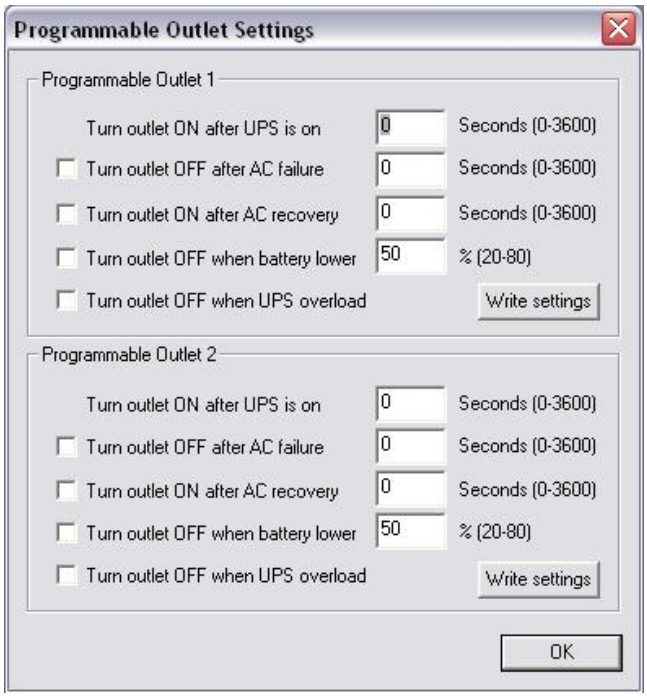



Programmable Outlet Settings
Programmable Outlet 1
Turn outlet ON after UPS is on 0 Seconds (0-3600)
Turn outlet OFF after AC failure 0 Seconds (0-3600)
Turn outlet ON after AC recovery 0 Seconds (0-3600)
Turn outlet OFF when battery lower 50 % (20-80)
Turn outlet OFF when UPS overload
Write settings
Programmable Outlet 2
Turn outlet ON after UPS is on 0 Seconds (0-3600)
Turn outlet OFF after AC failure 0 Seconds (0-3600)
Turn outlet ON after AC recovery 0 Seconds (0-3600)
Turn outlet OFF when battery lower 50 % (20-80)
Turn outlet OFF when UPS overload
Write settings
OK

1. **Turn outlet ON after UPS is on** – select the time to automatically enable this outlet within the specified time when the UPS is powered on. If “0” sec is selected, the outlet will be enabled once the UPS is powered on.

2. **Turn outlet OFF after AC failure** – select this option to automatically disable the outlet within the specified time after utility outage to shed the less critical loads to provide longer battery back-up time for the other more critical loads connected to the UPS.

3. **Turn outlet ON after AC recovery** – select this option to automatically enable the outlet within the specified time after the utility is restored.

4. **Turn outlet OFF when battery lower …%** - select this option to automatically disable the outlet at the specified remaining battery power capacity(%) during battery mode to shed the less critical loads to prolong battery back-up time for the other more critical loads connected to the UPS.

5. **Turn outlet OFF when UPS overload** – select this option to automatically disable the outlet during overload condition (bypass mode) to possibly allow the more critical loads

6. Click on “Write settings” to confirm the configurations.

3.5. Communication Port Explanation

The UPS is equip with EPO dry contacts input, true RS232 & USB Communication port as standard to provide communication with bundled UPS monitoring software for remote monitoring of UPS status via PC.

The bundled software of the UPS is compatible with many operating systems such as Windows 98, & 2000, ME, NT, XP and Vista. For other applications such as Novell, NetWare, Unix, Linux, please contact your local dealer for suitable software.
All the communication ports (including optional cards) can be active & use simultaneously to monitor the UPS status. However only 1 communication interface at any one time with the highest priority has the ability to command & control the UPS. The priority of these communication interfaces are as follow:

Highest Priority (in descending order),

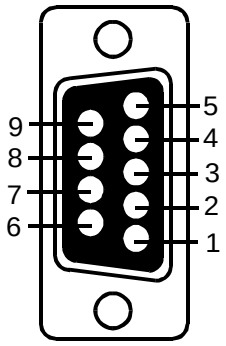
1) EPO input port
2) Optional Interface Card
3) USB
4) RS232

3.5.1. True RS232 Port Descriptions

The RS232 interface shall be set as follows:

Baud Rate	**2400 bps**
Data Length	**8 bits**
Stop Bit	**1 bit**
Parity	**None**

The Pin Assignments of the true RS232 port are illustrated as follows:



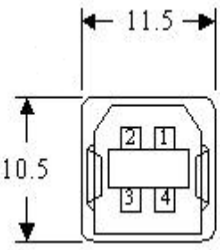
Pin 3: RS232 Rx
Pin 2: RS232 Tx
Pin 5: Ground

- To be continually supplied via Bypass without shut down

3.5.2. USB Port Descriptions

The USB communication protocol definition as below:

1. Comply with USB version 1.0, 1.5Mbps
2. Comply with USB HID Version 1.0.
3. The Pin Assignments of the USB port:



1 → VCC (+5V)
2 → D -
3 → D +
4 → Ground

3.5.3. EPO (Emergency Power Off)

The Pin assignments of the EPO Input port are:

1 → EPO+
2 → Ground

To enable the EPO function, please short Pin 1 & 2.

4. Installation and Operation

Warning!
Read the Safety Instruction guide (page 5 to 6) before installing the UPS!

4.1. Unpacking

Inspect the UPS upon receipt. The manufacturer designed robust packaging for your product. However, accidents and damage may occur during shipment. Notify the forwarder and dealer if there is damage.

The packaging is recyclable; save it for reuse or dispose of it properly.

- Remove the UPS from the carton box.
- Check the package contents. Standard content shall includes:

- 1 set of User's Manual
- 2 pcs of IEC output cables (for UPS with IEC sockets only)
- 1 pc of AC Input Power Cord
- 1 set of UPS communication software with RS232 and USB cable
- 1 set of Tower/Rack Accessories Kit

4.2. Selecting Installation Position

Warning!
The UPS is heavy.

Select a location sturdy enough to handle the UPS weight. To ensure proper operation and long operating life, always position the UPS according to the following requirement:

1. Keep minimum 20cm (8 inches) distance clearance from the rear panel of the UPS to avoid any obstructions.

2. Do not block the air-flow to the ventilation louvers of the unit.

3. Please ensure the installation site is free from excessive dust and the ambient temperature and humidity should be within the specified limits.

4. Do not place the UPS in a dusty or corrosive environment or near any flammable objects.

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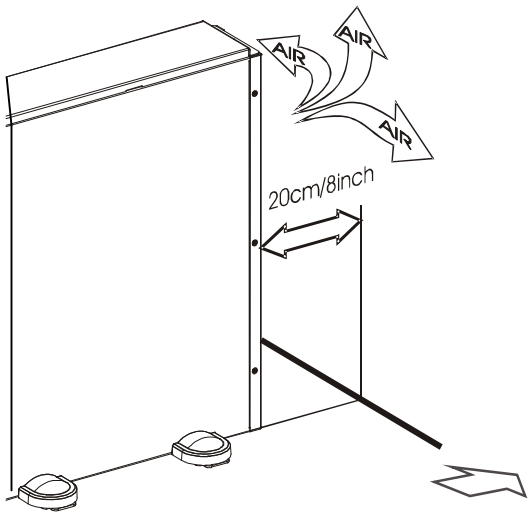
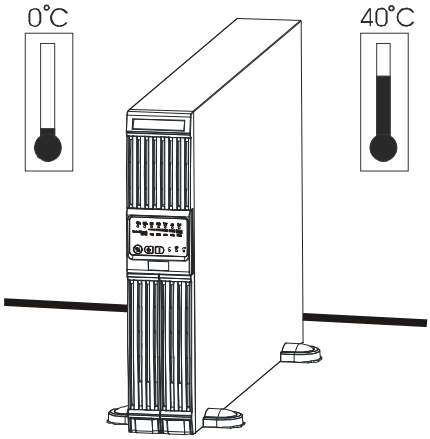
5. This UPS is not designed for outdoor use.



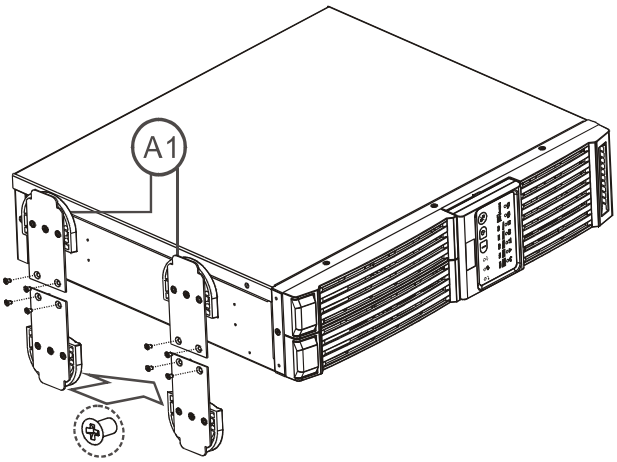


Relative humidity
(non condensation) 30%~90%

Note!
The recommended temperature range for the batteries is between 20 and 30°C. Is the UPS running permanent in an environment with temperatures over 40°C this will lead to a clear shortened life-time of the batteries. In some cases this can cause damage on the batteries and the ups.

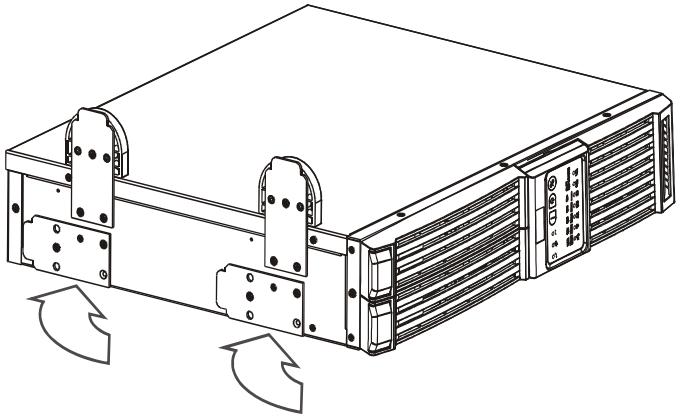
4.3. Set up

4.3.1. Tower Configuration Setup

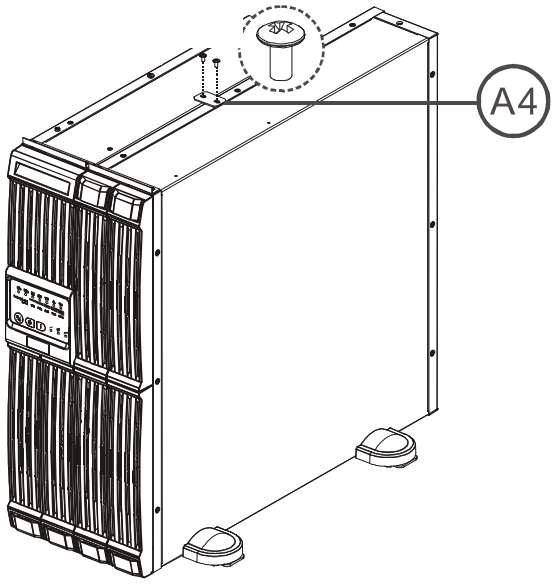


4.3.2. Power Module + Battery Module

Step 1



Step 2



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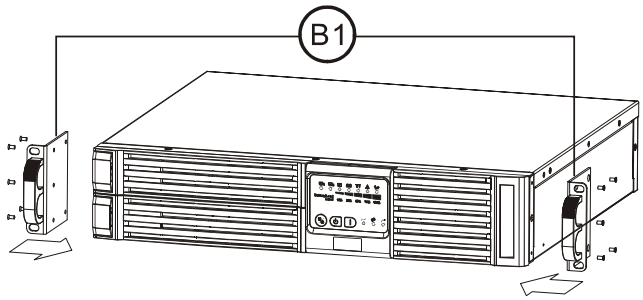
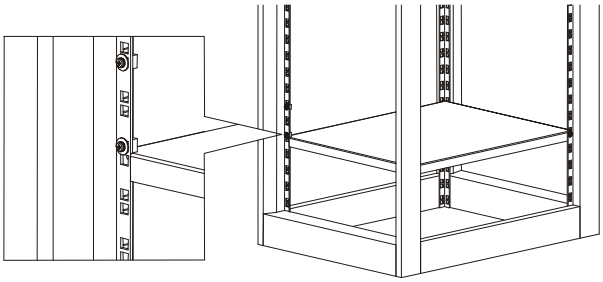
4.3.3. Rack-Mount Configuration Setup

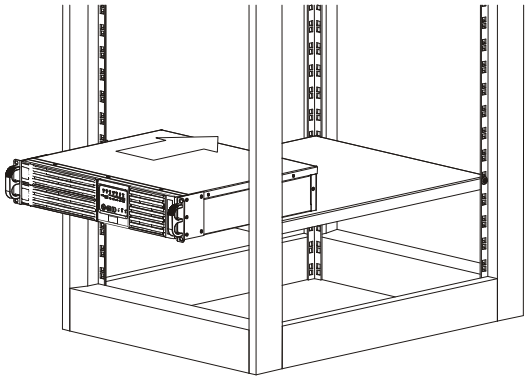
Step 1



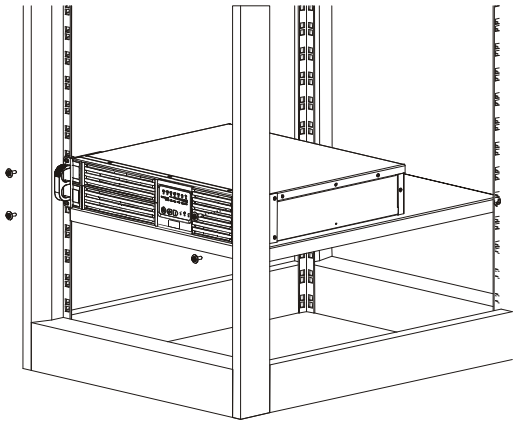
Step 2



Step 3



Step 4



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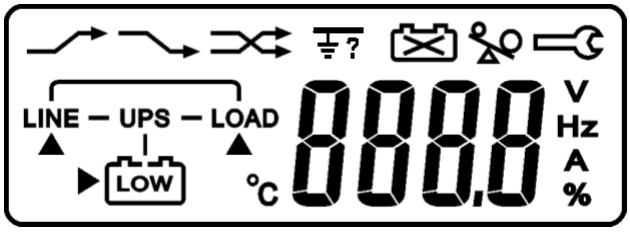
4.4. Operation

4.4.1. Start Up In Normal Mode

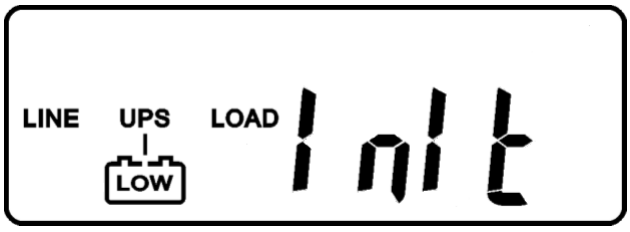
1. Make sure the voltage of Utility matches with the input voltage window of the UPS.
2. Connect the UPS to the wall Receptacle of the Utility. Turn on the UPS “ON” switch to start up the UPS. LED (Nr. 2) and (Nr. 5) light up to indicate the Utility and the By-pass are normal. The LCD will illustrate from drawing A to drawing B.



drawing A

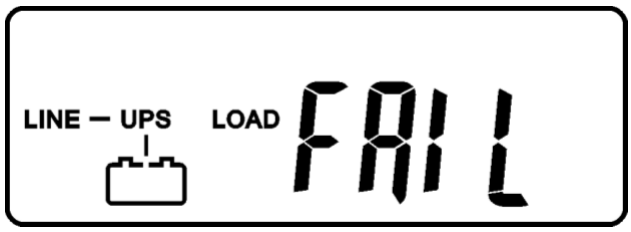
drawing B

3. Then, the UPS is in Standby Mode now and it will proceed self-test automatically. If there is no abnormal message occurred, it means the pre-startup of the UPS is successful and the charger starts to charge the batteries.
4. Press the UPS “ON” Switch for approx. 3 seconds, then the Buzzer sounds twice. If the UPS start-up is successful, the LCD display changes from drawing B to drawing C.

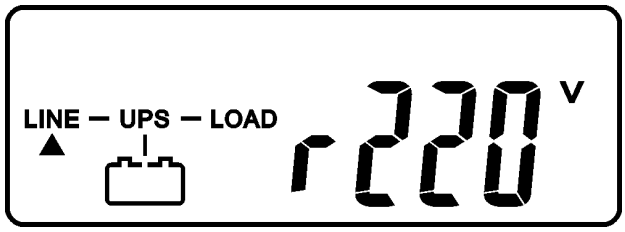


drawing C

5. In case of failure in self-test, the LCD display will illustrate as drawing D, then, an error code or error status will be shown on the screen.



drawing D

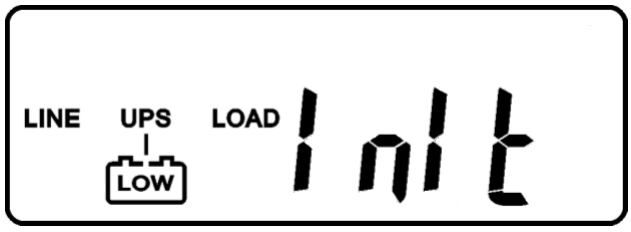


drawing E

6. Your start-up operation of the UPS is completely now as illustrated as drawing E. Make sure the UPS is plugged onto the wall receptacle for charging at least 8 hours and the batteries of the UPS are fully charged

4.4.2. Start-up in Battery Mode (Cold Start)

1. Make sure the UPS has already been installed with batteries.
2. Press the UPS “ON” switch to awake the UPS for approx. 3 seconds, and then the buzzer sounds twice. The LCD display will illustrate from drawing A to drawing B.

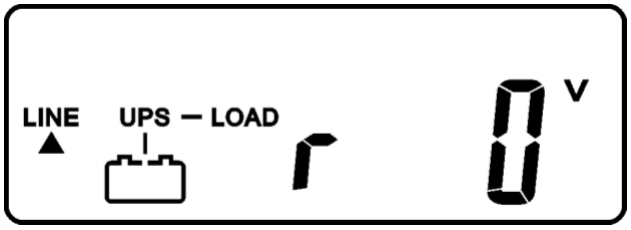


drawing G

3. Press the UPS “ON” switch of the UPS again for approx. 3 seconds till the LCD display illustrates from drawing B to drawing G, then the UPS will be in self-test Mode. The UPS may offer energy to the output in a minute, and the LCD display illustrates as drawing H. In case of failure in pushing the UPS “ON” Switch in 10 seconds, the UPS will automatically turn off.

Note!
Was the UPS started in Battery Mode it will not switch to Normal Mode if the Utility is connected during the Initial phase. The UPS

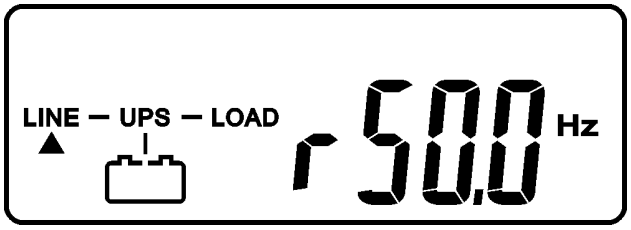
must be completely restarted to get back to Normal Mode.



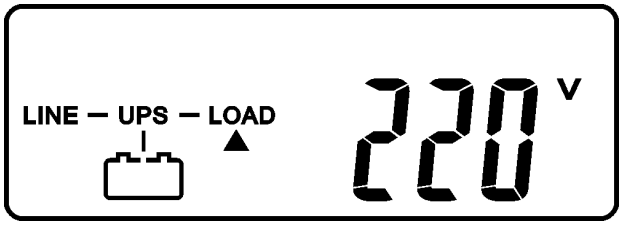
drawing H

4.4.3. Check Measured Values & Figures detected by UPS

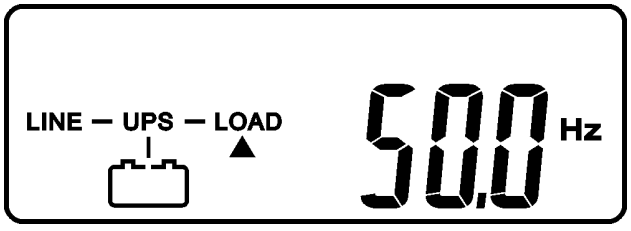
If you would like to check the measured values & messages, please use scroll up and scroll down key pads. When you use scroll down key pad, the LCD display will illustrate in sequence from drawing E(Input Voltage) → drawing J(Input Frequency)→ drawing K(UPS Output Voltage) → drawing L(UPS Output Frequency)→ drawing M(UPS Output Load percentage)→ drawing N(UPS Battery Voltage) →drawing O(UPS inner temperature).



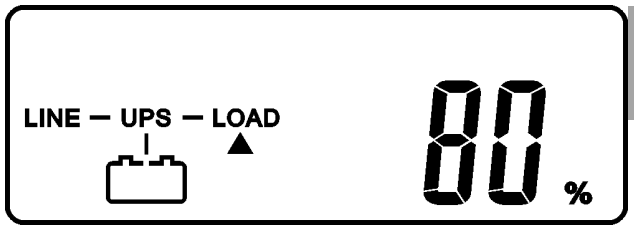
drawing J



drawing K

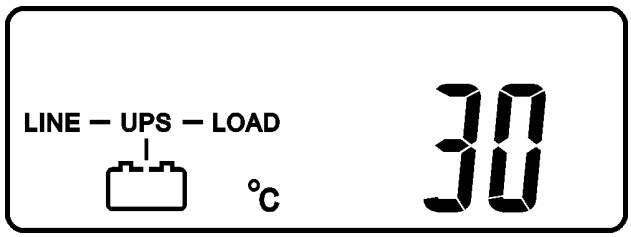


drawing L



drawing M

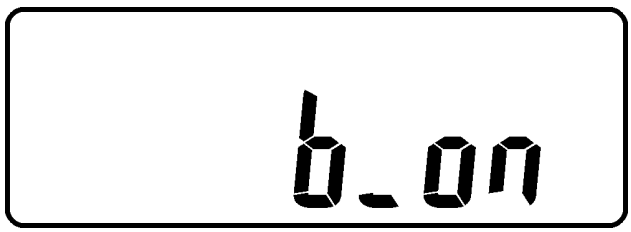
drawing N



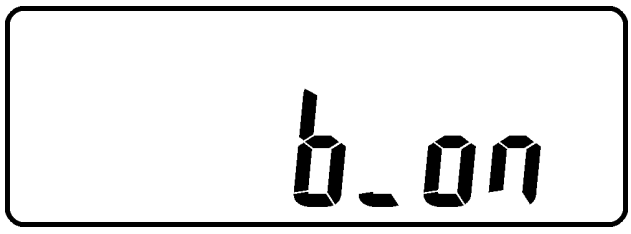
drawing O

4.4.4. UPS Default Data and Special Function Execution

1. After UPS is turned on successfully, use key 9 (Chapter 3.1) pad to change the LCD Display screen to drawing P1.



drawing P1

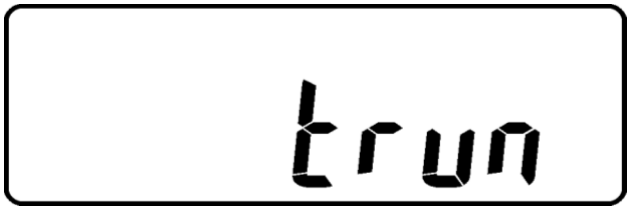


drawing P2

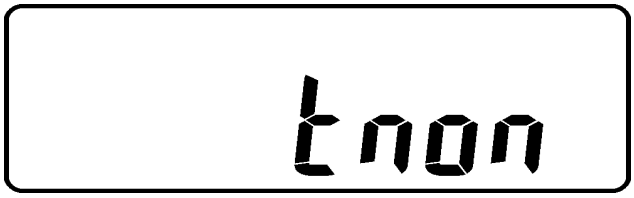
2. Press key pad to scroll down the LCD screen, then check the UPS settings. The LCD display will show in sequence: drawing P1(buzzer)→drawing Q1(self test)→drawing R1(Bypass Voltage)→drawing S(Output Fre-

EN

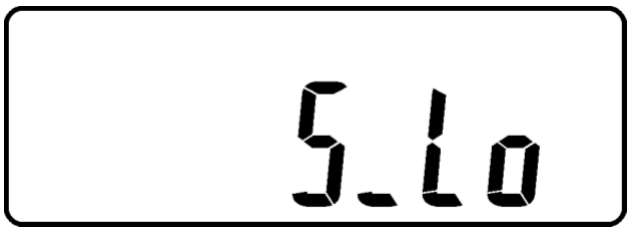
quency Synchronized Window)→drawing T (Inverter Output Voltage)→drawing U1(UPS Operation Mode)→drawing V(Output Voltage Fine Tuning).



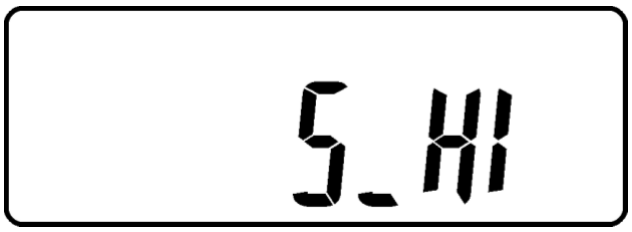
drawing Q1



drawing Q2

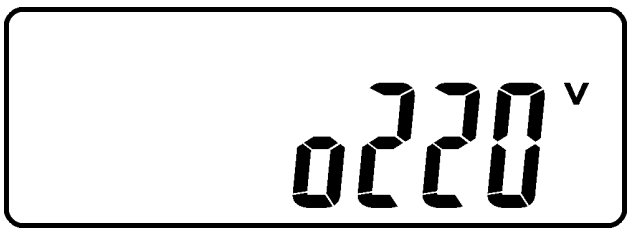


drawing R1

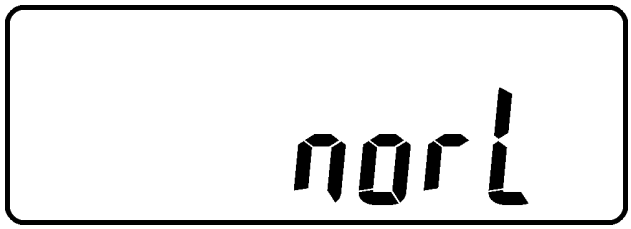


drawing R2

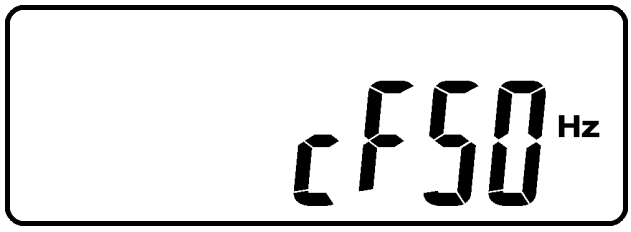
drawing S



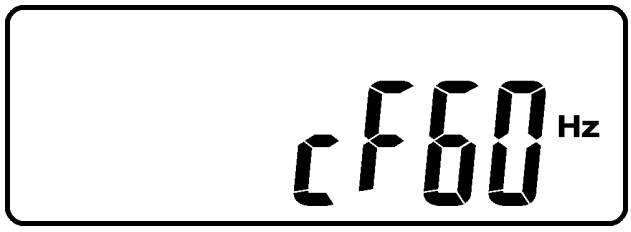
drawing T



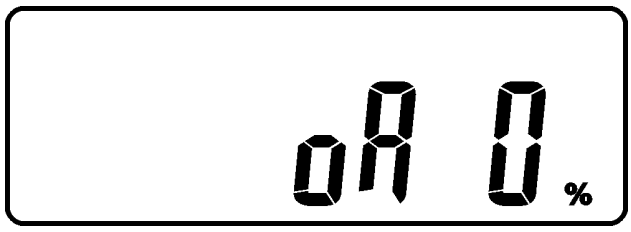
drawing U1



drawing U2

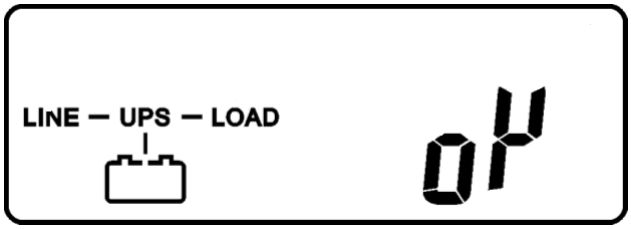


drawing U3



drawing V

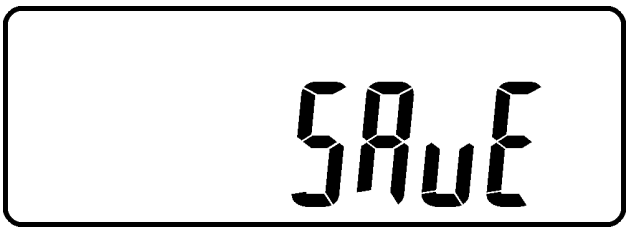
3. Press scroll up key pad, you may execute special functions. The functions include Buzzer ON (as drawing Q1) or buzzer OFF (as drawing Q2, Alarm silence for UPS warning) and self-test OFF (as drawing Q2). UPS will execute battery test for 10 seconds, if the self-test is successful, it show as drawing W; otherwise, it will show as drawing D & error message at the same time.



drawing W

4.4.5. UPS default settings and their alternatives

1. Make sure the UPS is not "ON" yet, which means it is not in Line Mode or Backup Mode. Press on UPS "ON" Switch and scroll down key pads simultaneously for approx. 3 seconds, the buzzer will sound twice, the LCD display screen shows as drawing P1, then the UPS is under setting mode now.
2. To scroll down the LCD screen, you may refer to Chapter 4.4.4. point 2.
3. Except Buzzer(as drawing P1 & P2) and self-test(Q1 & Q2), all the rest default settings may be changed by pressing scroll up key pad. Drawings R1 and R2 mean the bypass input acceptable window, it can be 176V AC~ 264V AC or 187V AC~264V AC for 220V AC system.
4. Drawing S means the bypass frequency window of the inverter output, the acceptable setting values are +/-3Hz and +/-1Hz.
5. Drawing T means the acceptable Inverter Output Voltage, of which voltage is 200V, 208V, 220V, 230V, or 240V for 220V AC system
6. Drawing U1, U2 and U3 mean the operation modes of the UPS, of which alternative is Online, fixed 50Hz Output or fixed 60Hz Output.
7. Drawing V means the adjustments of the Inverter Output, which may be calibrated as 0%, +1%, -1%, +2%, -2%, +3%, or -3%.
8. When all the setting changes are done, you have to press enter key pad to save all the changes when the LCD screen shows as drawing X. All those changes will be activated only when the UPS is re-turned on. The LCD screen will be back to the original screen before setting.



drawing X

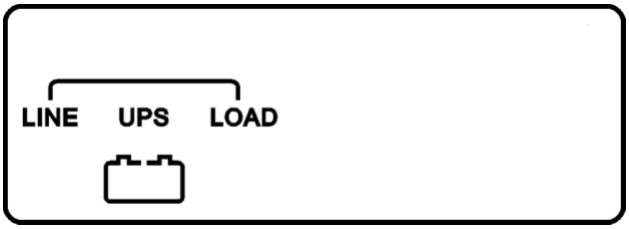
9. Turn off the UPS and the input breaker of the Utility.
10. Your Setting changes are complete.

4.4.6. UPS is off due to unknown reason and is trouble thooting

1. If there is a serious abnormal condition occurred, the UPS will lock itself in "OFF" position as shown in the drawing Y and a abnormal message will show in the LCD screen.

drawing Y

2. For some special conditions, the UPS will lock itself; however, it is still allowed to have bypass output in most of conditions and the LCD screens will show as drawing Z and error message will be shown on the screen.



drawing Z

3. To release the UPS lock, please proceed the followings:
   (a) Check those error messages recorded

(b) Check to see Chapter 6.1 to trouble shoot the problem of the UPS; otherwise, consult your local distributor for service.
(c) Press ⏻ key pad for 5 seconds and buzzer will sound twice.
(d) Turn off the Breaker of the Utility Input.
(e) The UPS lock problem is solved now.

4.4.7. Shut Off

1. Press ⏻ key pad for about 5 seconds, the Inverter output will be turned off, then the output load is supplied by Bypass loop and the LCD screen shows as Drawing B.
2. Turn off the input of the UPS.
3. The UPS is turned off completely.

4.4.8. Bypass Mode

The PMC12 can be switched to Bypass Mode any time during online mode (see 4.4.5.6).
It can be switched to bypass by pressing the button 7 “ON” and 11 “UP” together for approx. 3 seconds. A buzzer sound a the blinking of LED 5 shows that the UPS is in Bypass Mode. The Display will show the bypass sign as shown in drawing Z.
The UPS can be switched back to Inverter Mode by repeating this action.
Again this will be confirmed by a buzzer sound and the display will get back to drawing E.

4.5. Status & Alarm Buzzer

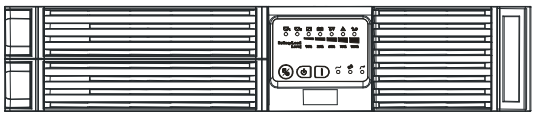
The following table helps to define some of the common UPS statuses with respect to their buzzer beep descriptions.

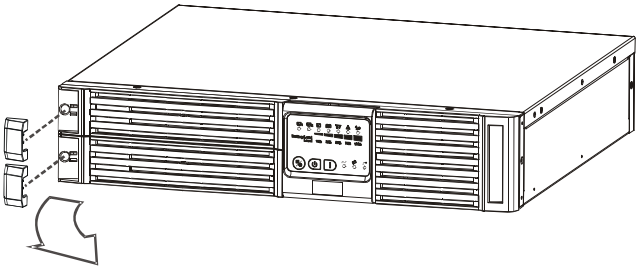
Status Definitions	Buzzer Beep Descriptions
UPS faulty, Inverter shutdown. All functions inhabited.	Long Continuous Beep
UPS faulty, loads continue to be supplied via Inverter or Bypass.	Single successive beep with ~ 2 sec interval
battery mode	Single short successive beep with ~1 sec interval
battery low	Very quick and short successive beep
confirm/RS232 port receiving	2 quick & short beeps
service mode ok	1 quick & short beep
UPS initial starts up with self test	2 successive quick & short beeps, repeating per ~2 sec interval.

EN

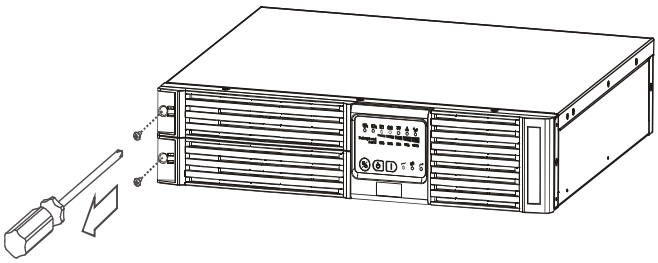
4.6. Battery Replacement PMC12

Step 1

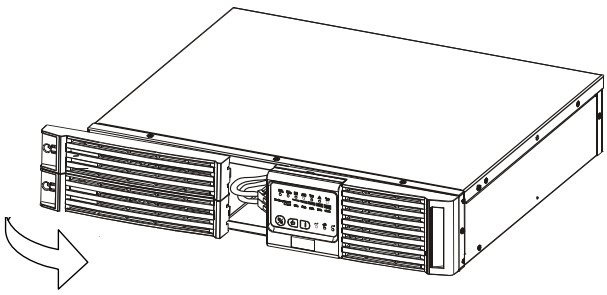




Step 2

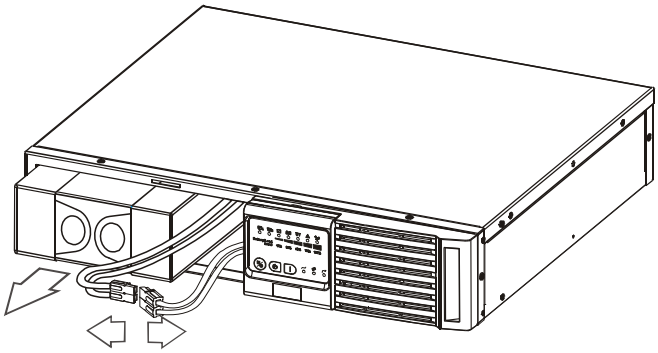


Step 3

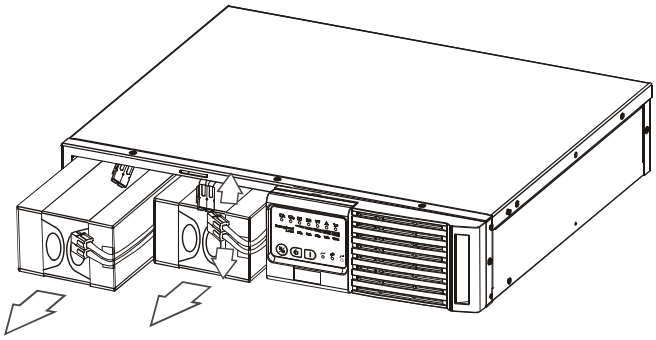


Note!
Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and required precautions. When replacing batteries, replace with the same type and number of batteries or battery packs

Step 4



1KVA



2K/3KVA

Note!
Was the used battery of the UPS System removed during normal operation this will not immediately be recognized by the PMC12 because after the startup the UPS will check only sporadically (approx. every 60 min.) if there is a battery connected.

Danger!
Do not nip in the ups during a change of batteries. Some parts can be under voltage!

Warning!
The lead acid battery may cause chemical hazard.
The battery presents a risk of energy hazard.
Do not dispose of batteries in a fire. The batteries may explode.
Do not open or mutilate batteries. Released electrolyte is harmful to skin and eyes. It may be toxic.

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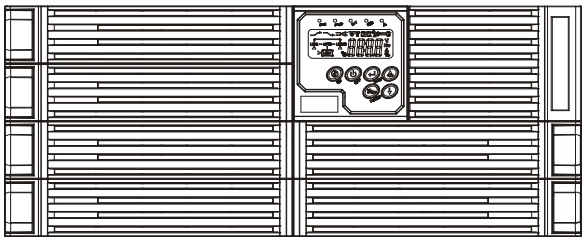
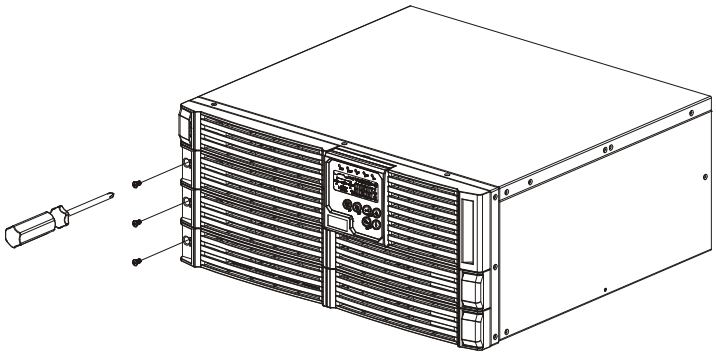
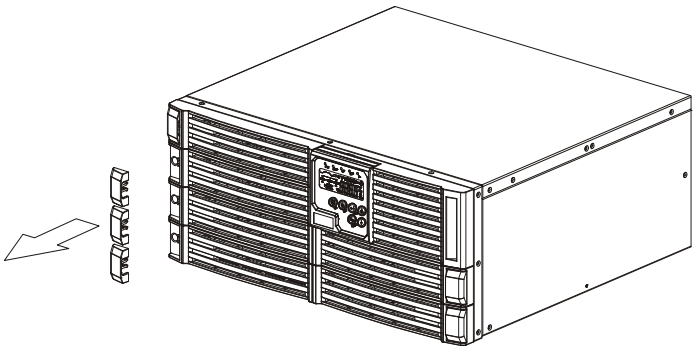
4.7. Battery Replacement PMC12 compact

Step 1:

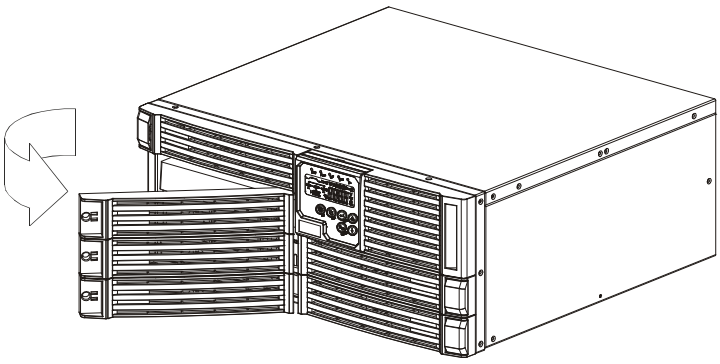




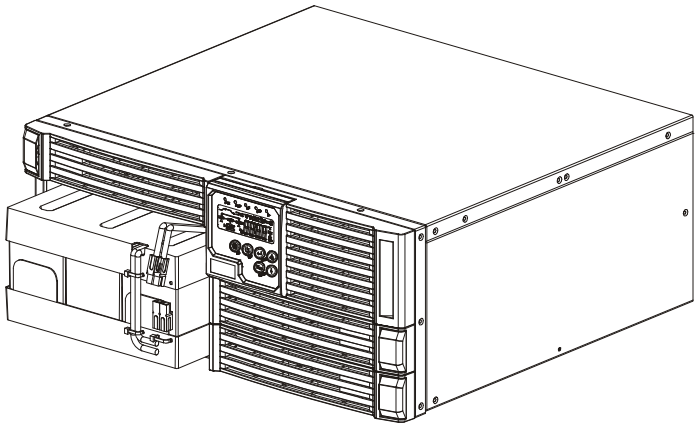
Step 2:



Step 3:



Step 4:



Note!
Was the used battery of the UPS System removed during normal operation this will not immediately be recognized by the PMC12 because after the startup the UPS will check only sporadically (approx. every 60 min.) if there is a battery connected.

Danger!
Do not nip in the ups during a change of batteries. Some parts can be under voltage!

Warning!
The lead acid battery may cause chemical hazard.
The battery presents a risk of energy hazard.
Do not dispose of batteries in a fire. The batteries may explode.
Do not open or mutilate batteries. Released electrolyte is harmful to skin and eyes. It may be toxic.

Note!
Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and required precautions. When replacing batteries, replace with the same type and number of batteries or battery packs

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5. UPS Working Principle

5.1. UPS System Block Diagram

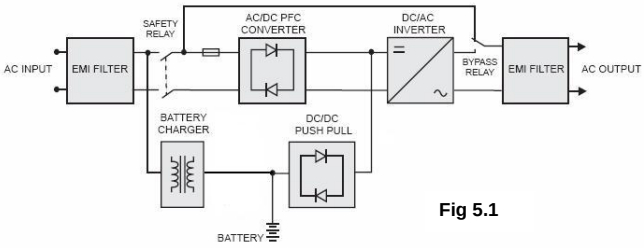

Fig 5.1

Figure 5.1 above illustrates the True On-Line Double Conversion architecture of the UPS system. The major modules consist of:

1. An AC to DC power converter (Rectifier) with PFC control circuit
2. A DC to AC power high frequency inverter
3. An Intelligent Battery Charger
4. A bank of stationary maintenance-free batteries
5. A DC to DC push/pull converter control circuit
6. A Static Bypass Loop
7. Input & Output EMI Filter

The table below provide a summery guide to the UPS operating modes against the Utility AC Power Source conditions.

Utility Conditions	UPS Operating Modes	LEDs Display indications
Mains Available	Rectifier convert AC to DC, battery charging, Inverter convert DC to AC and supply to loads with clean & stable power.	~, 1, 2 LEDs remain illuminated
Mains Absent (under or over voltage)	Rectifier and charger stop operating, Battery discharge via DC~DC boost circuit and supply to Inverter. Loads continue to receive supply from Inverter. Alarm buzzer beeps, UPS now on battery mode.	~ LED (Nr. 2) off,
Mains Absent, Battery low voltage	Rectifier and charger stop operating, Battery discharge via DC~DC boost circuit and supply to Inverter. Alarm buzzer beeps with quick & short succession, indicating battery power low and Inverter may stop supply soon.	~ LED off, ⚠ LED illuminated. In LCD lights up LOW .

Paragraph 5.2 ~ 5.7 below provide detailed descriptions of the UPS operating principle.

5.2. When Mains is Available

When Mains is available, the AC source is rectified to DC, partially fed into the charger to charge battery and partially fed into inverter. The inverter revert the DC to a cleaned and pure AC to supply energy to the load connected. The ~, 1, 2 LED's illuminated.

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5.3. When Mains is Absent

The working principle of the UPS under Mains absent condition is illustrated as follows:

1. When Mains absent, the UPS will direct the battery energy automatically to the Inverter without delay, and turn off the charger and AC/DC converter. The inverter revert DC to AC to supply energy to the output load connected without interruption. The ~ (Nr. 5) LED only will be illuminated.

2. When Mains is back to Normal, the UPS will turn on the AC/DC converter, turn off DC/DC converter and switch the charger to charging mode. It has the same working principle as figure 5.2.

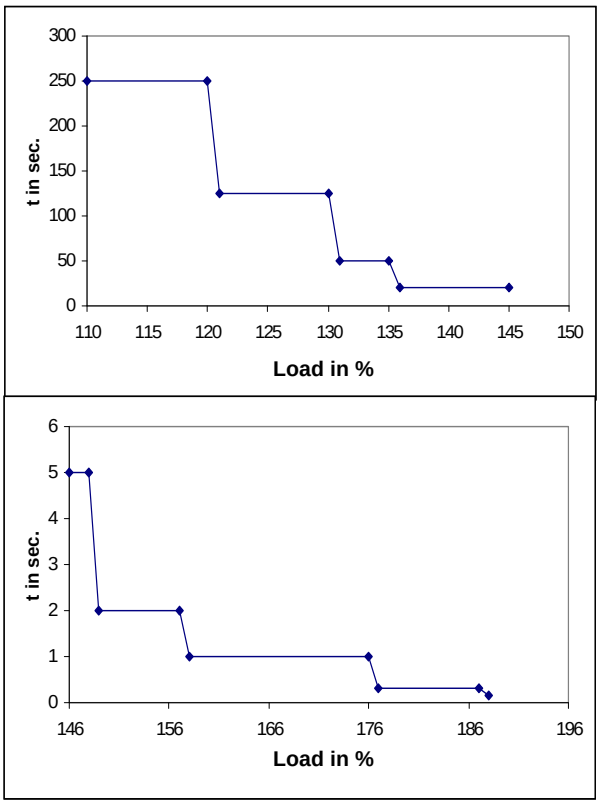
3. During a Power outage, the UPS will work as illustrated in figure 5.3. When Battery is low, buzzer will beep continuously till battery is completely cut off. The battery low protection of the UPS will cut off battery supply after a preset threshold to avoid the battery from over-drain. The ⚠ LED & LOW symbol in LCD will light up till the UPS is completely cut off. The UPS will re-start automatically when Mains is available.

5.4. Overload Condition

1. Generally modern day electronics & IT equipment generate an inrush current when switching on. The amount of inrush current varies from equipment to equipment, some can be as high as 6 times its rated capacity while others produce negligible inrush. To prevent severe damage to its Inverter cause by the inrush produce by the loads, the UPS is equipped with electronics overload protection feature as standard. If the UPS loading is >105~120% of its capacity, it will switch to bypass mode in 30 seconds to protect the Inverter. If overload condition is eliminated by reducing the load to <105%, the UPS will switch back to Inverter mode automatically. If the UPS is over 150% loading, it inverter will shutdown immediately.

2. The UPS Bypass loop is also equipped with overload protection. Its overload capacity is illustrated by the graph & table below.

Load (%)	110~120	121~130	131~135	136~145	146~148	149~157	158~176	177~187	188<
Delay Time (Sec)	250	125	50	20	5	2	1	0.32	0.16



5.5. Inverter Failure

5.5.1. Output Load short circuit when supply via inverter

If output load is short circuited while supply via Inverter, the UPS will shutdown Inverter automatically and stop supply to the loads. The Fault LED lights up and the buzzer will beep continuously. The UPS will not switch on automatically after short circuit condition is eliminated. The UPS has to be re-start manually (refer to 'Start Up in Normal AC Mode).

5.5.2. Inverter/Internal Over temperature

If the UPS experiences internal over-temperature when Utility is normal, it will switch to bypass loop. The UPS will switch back to inverter mode when the over-temperature situation is eliminated. If over temperature occurs when Utility is abnormal, the buzzer will beep continuously and the Fault LED ⚠ will light up. The UPS will cut off supply to the loads.

5.5.3. Inverter Over-current and Inverter Output Voltage out of tolerance

If the UPS inverter delivers over-current and out-of-tolerance voltage to its outlets, the UPS is out of order. The UPS will switch to bypass loop when Utility is normal. The Utility ~ LED and Fault ⚠ LED will light up.

If these two fault conditions occur when Utility is abnormal, the UPS will cut off the supply to its outlets and the Fault ⚠ LED will light up.

6. Maintenance Guide

6.1. Trouble Shooting

When the UPS becomes faulty or malfunctions during operation, you may check the fault lists below for respective solutions. Should the problem persists, please contact your local dealer for assistance.

Situation	Check Items	Solution
UPS Fault ⚠ LED Read the error code from the LCD display.	1.Er05, Er25,	1. Check battery connection if is properly done. Measure Battery voltage to ensure batteries are charged or healthy. Recharge batteries for 8 hours if necessary. Simulate Utility outage to verify if UPS is able to provide DC back-up. Otherwise consult your local dealer right away.
	2. Overload	2. Disconnect some non critical loads form the UPS output until overload ceases. Check if there is any short circuit between cables due to broken cable insulator. Replace the cables in necessary.
	3.Er11 (UPS Over Temperature)	3. Remove any objects obstructing the ventilation louvers. Verify if the cooling fans are working properly. Contacts your local dealer to replace the fans if necessary.
	4.Site wiring/Ground fault ⏚?	4. Verify if the “L” & “N” phase of the Utility AC source has been wrongly wired or if the Ground-Neutral Voltage exceeded the limits
	5.Er14 (Fans out of order)	5. Verify if the ventilating fans are functioning properly. Do not attempt to replace the fans by yourself. Contact your local dealer for replacement.
	6.Other error codes	6. Consult your local dealer for assistance.

Maintenance Guide

Situation	Check Items	Solution
UPS fails to provide battery backup or its back up time is shorter than its intended performance.		If the backup time remains non-satisfactory after 8 hours of charging, please contact your local dealer for battery replacement.
UPS is normal but no Output to load	Check if all power codes are properly connected.	If problem persist, consult your local dealer for technical assistance.
The UPS switches to battery mode then back to Utility mode, when connected device is turned on. Or, the UPS switches back and forth between battery and Utility.	1. If any power strip is connected to the UPS. 2. Verify if there is any damage to the utility Wall Receptacle or if the cable cord plug is faulty.	1. Do not use power strip. 2. Replace the wall receptacle/cable cord plug.
Strange noise and smell		Immediately shut down the whole System. Disconnect the power from the UPS and call for service.
UPS is unable to provide backup power source		Check that the battery connectors are fully engaged. Allow the battery to recharge if the batter is weak. If problem persist after recharging, replace the battery. If problem persist, consult your local dealer, Rittal or customer service for technical assistance.

Note!
When the Fault LED is illuminated, the error code is shown in the LCD display. Check the error code. If there is no Error Code shown in the Display, you can retrieve the Code by push the “OFF” button for not more than 2 seconds.

6.2. Error Codes and their Descriptions

Code	Descriptions
Er05	Battery weak or faulty
Er06	Output short-circuited
Er07	EPO mode
Er11	UPS over-temperature
Er12	Inverter overload
Er14	Fans out of order
Er18	EEPROM's data error
Er24	Utility Low (<170V) & Battery Disconnect
Er28	Bypass overload

Note!
Does the PMC12 show an Error Code that is not described in the above table please contact the Rittal Service.

6.3. Maintenance

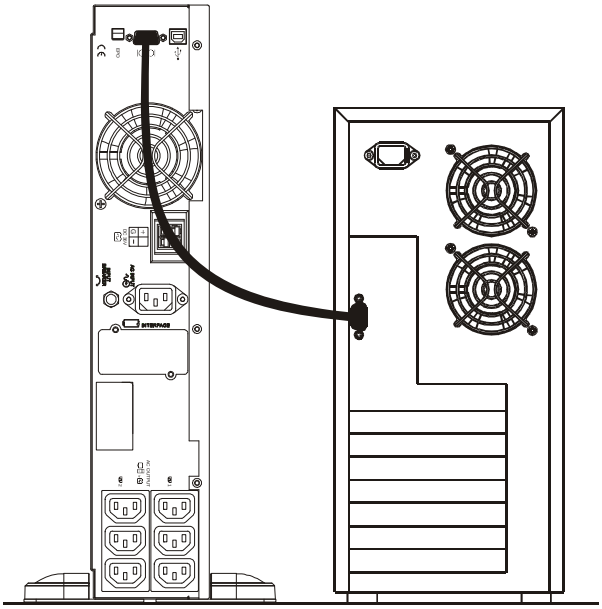
Clean the dust from the ventilation openings and intakes on the rear panel.

1. Turn off the UPS and wipe the casing with a damp cloth.
2. Periodically unplug the power cord of the UPS from the wall receptacle to test the condition batteries. The period should be determined by the user according to his requirements as well as surroundings.
3. Be sure you have already saved your application before you proceed the battery discharging capability test.

7. Bundle Software Installation

7.1. Hardware Installation

1. Connect the male connector of RS232/USB cable to the UPS communication port.
2. Connect the female connector of the RS232/USB cable to a dedicated RS232 port of the Computer.
3. For optional interface cards, please refer to Chapter 8 for more details.



7.2. Software Installation

Please visit our website www.rimatrix5.com and for download from UPS software www.rimatrix5.com/dl_power.htm.

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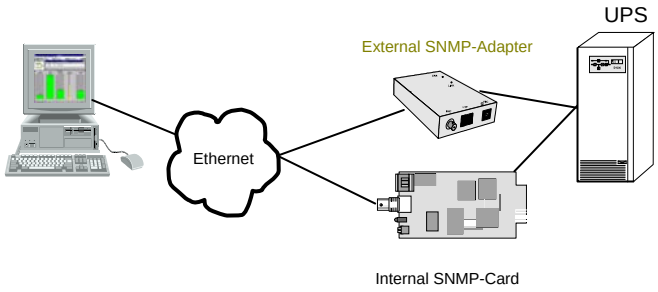
8. Optional Communication Card

The **S**imple **N**etwork **M**anagement **P**rotocol (SNMP) is a worldwide-standardized communication-protocol. It is used to monitor any device in the network via simple control language. The UPS-Management Software also provides its data in this SNMP format with its internal software agent. The operating system you are using must support the SNMP protocol. We offer our software with SNMP functionality for Novell, OS/2, all Windows running on INTEL and ALPHA, DEC VMS, Apple.
Two types of SNMP interfaces with identical functionality are available: an external SNMP-Adapter (Box) and an internal SNMP-Card. Both can manage a parallel system (N modules) and return either global values - which are consistent for the whole parallel system - or specific values from the single modules.

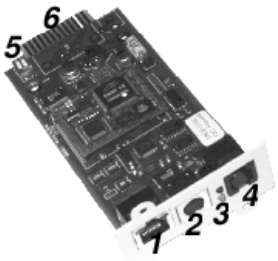


8.1. SNMP Adapter

The adapter may be configured via Telnet, HTTP (Web-Browser) or serial connection (Terminal). For normal operation at least one network connection (Ethernet) is required.

The SNMP adapter can be used, utilising the RCCMD send function, for an automatic network wide shut down or just for informing connected users. The shut down procedure can be initiated on a low residual battery autonomy time (downtime) or by a countdown timer which is started at the beginning of the alarm. A shut down is therefore possible without extra input from the operator, and is fully software controlled.

8.2. Internal SNMP Adapter



The Internal SNMP-Card can be inserted into an appropriate extension slot of the PMC**.** This adapter communicates via the serial port of the UPS and makes a direct multiple server shut down possible without additional SNMP management software.

For detailed information please see Software Manual provided with the PMC-Software CD ROM. RCCMD - Remote Console Command module for a multi-server shutdown. This standalone software module is designed to receive and execute a command issued by a remote device. Thanks to RCCMD it is possible to execute a shutdown in an heterogeneous multiplatform network. The new release RCCMD2 is an application available for all Operating Systems, analogous to PMC-Software. Our SNMP Interfaces are compatible to RCCMD.

9. Customer Service

If you have any technical questions or questions concerning our product spectrum, contact the following service address:

Tel.: +49 (0)2772/505-1855
http://www.rimatrix5.com
E-mail: info@rittal.de

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10. Technical Specifications

Model			1KVA	2KVA	3KVA
VA Rating					
Apparent Output Power			1000VA	2000VA	3000VA
Active Output Power			800 Watts	1600 Watts	2400 Watts
Power Factor			0,8		
Topology			Double conversion On-Line		
Type			Rack/Tower		
Agency Approvals			230V Models: CE		
Input					
Voltage Window		230V	120/140/160 - 288Vac		
Voltage Range	Base on load percentage (0~33/33~66/66~100%)				
	Low Line Transfer	230V	120/140/160Vac		
	Low Line Comeback	230V	170Vac		
	High Line Transfer	230V	288Vac		
	High Line Comeback	230V	278Vac		
Frequency			50/60 Hz auto-select, ± 5Hz		
Phase			Single phase with ground		
PF			> 0,99 at full rated linear load		
Typical Transfer Time			0 ms		
AC Leakage current		230V	≤ 3,5mA		
Surge Protection		230V	300 joules		
Output					
Output (INV. mode)	Voltage	230V	230V,adjustable to 220/230/240		
	Voltage Regulation		≤± 1% until low battery warning		
	Frequency(Synchronized Range)		3Hz or 1Hz (setting by software)		
	Frequency(Battery Mode)		±0,1% (0,05~0,06Hz) unless synchronized to line		
	Current Crest Factor		3:1		

Technical Specifications

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Efficiency	Harmonic Distortion	3% THD(Linear Load) 7% THD(Non-Linear Load)		
	Transient Response(ms)	60ms/5%		
	Waveform	Pure Sine wave		
Efficiency	To AC Mode (Full load)	88%	88%	90%
	To Battery Mode (Full load)	85%	85%	87%

Model	**1KVA**	**2KVA**	**3KVA**
Battery System			
Type	12V/7,2Ah	12V/7,2Ah	12V/9Ah
Numbers of Batteries	3	6	6
Backup Time(100%)	>7min.	>7min.	>5min.
Backup Time(80%)	>9min.	>10min.	>9min.
Backup Time(60%)	>14min.	>14min.	>12min.
Backup Time(40%)	>27min.	>22min.	>19min.
Backup Time(20%)	>55min.	>66min.	>45min.
Recharging Time	4 Hours to 90%		
Charging Current (Max.)	1,8A	2,1A	2,7A
Charging Voltage	41,0Vdc±0,5V	82,0Vdc±0,5V	82,0Vdc±0,5V
Hot Swappable Battery	Yes		
Internal battery	Yes		
DC leakage current	≤ 30μA (±10μA) with no AC applied and the unit in the off position		
Battery type	Sealed, non-spillage, maintenance-free, lead acid		
Transfer Time			
AC to DC	Zero		
Inverter to Bypass	2,5ms(Typical)	Zero	
DC Start	Yes		
Self Diagnostics	By button of the panel or Software Control		
Front Panel			
LED	Load Level / Battery Level / Battery Mode / Normal Mode / Bypass Mode / Self-Test / Weak Battery / Site Wiring Fault / General Fault / Overload / Programmable Outlet1 / Programmable Outlet 2		
Key	ON Button/ OFF Button/ (Test/Alarm Reset Button)		

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Protection				
Overload		(AC Mode) <105% continuous >106% ~ 120% for 30 seconds transfer to bypass >121% ~ 150% for 10 seconds transfer to bypass >150% for immediately transfer to bypass Buzzer continuously alarms.		
		(Battery Mode) <105% continuous >106% ~ 120% for 30 seconds shuts down >121% ~ 150% for 10 seconds shuts down >150% for immediately shuts down Buzzer continuously alarms.		
		(Bypass Mode) <105% continuous >106% ~ 120% for 250 seconds shuts down >121% ~ 130% for 125 seconds shuts down >131% ~ 135% for 50 seconds shuts down >136% ~ 145% for 20 seconds shuts down >146% ~ 148% for 5 seconds shuts down >149% ~ 157% for 2 seconds shuts down >158% ~ 176% for 1 seconds shuts down >177% ~ 187% for 0,32 seconds shuts down >188% for 0,16 seconds shuts down Buzzer continuously alarms.		
Short Circuit		Bypass mode : Input Fuse/Input Breaker Normal Mode: Output Breaker/Electronic Circuit Battery Mode: Output Breaker/Electronic Circuit		
Battery		ABDM		
EPO		UPS shuts down immediately		
Over Temperature	Normal Mode	Transfer to Bypass Mode		
	Battery Mode	UPS shuts down immediately		
Audible Alarm				
Battery Mode		Sounding once every 1,5 seconds		
Low Battery		Sounding once every 0,2 seconds		
Overload		Sounding once every 3 second		
Fault		Continuously Sounding (or Sounding once every 3 second)		
Physical				
Dimensions mm (HxWxD) **PMC12 Standard Design**		88(2U)x440x405	88(2U)x440x 650	88.8(2U)x440x 650
Dimensions mm (HxWxD) **PMC12 compact Design**			176(4U)x440x420	176(4U)x440x420
Weights		15,7kg (34,5lb)	29,4kg (64,7lb)	29,7kg (65,3lb)
Input Connection	230V	10A, IEC 320-C14	10A, IEC 320-C14	16A, IEC 320-C20
Output Connection	230V	(6) 10A,IEC 320-C13	(4) 10A,IEC 320-C13 (1) 16A,IEC 320-C19	

Technical Specifications

EN

Environmental	
Operation Temperature*	0 - 40 °C
Noise Level	< 50 dBA
Relative Humidity	0 to 90% (Without condensation)
Interface	
Interface Type	1x USB port, 1x RS-232 port, 1x Slot for Communication Card
SNMP	Power management from SNMP manager and Web browser
Compatible platforms	Windows 95/98/NT/2000/XP/Vista, Novell NetWare, Linux, etc.
Standards and Certification	
Safety	IEC/EN 62040-1-1,IEC 60950-1
Performance	IEC/EN 62040-3
EMC	IEC/EN62040-2 Class A, FCC Part 15 Subpart B Class A, IEC/EN55011, CISPR11, IEC61000-4-2/-3/-4/-5, IEC61000-2-2, IEC61000-3-2/-3
Markings	CE, WEEE

***NOTE: Is the UPS running in an environment with temperatures over 40°C this will lead to a clear shortened life-time of the batteries. In some cases this can cause damage on the batteries and the UPS.**

Model		1KVA	2KVA	3KVA
Backup Time with Extended Battery Module				
1 extended Battery module	Load			
	100%	>28min.	>17min.	>12min.
	80%	>35min.	>24min.	>17min.
	60%	>55min.	>32min.	>24min.
	40%	>110min.	>50min.	>37min.
	20%	>155min.	>105min.	>88min.
2 extended Battery modules	Load			
	100%	>55min.	>29min.	>20min.
	80%	>68min.	>38min.	>26min.
	60%	>96min.	>51min.	>35min.
	40%	>144min.	>86min.	>58min.
	20%	>300min.	>175min.	>127min.

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Schaltschrank-Systeme
Industrial Enclosures
Coffrets et armoires électriques
Kastsystemen
Apparatskåpssystem
Armadi per quadri di comando
Sistemas de armarios
インダストリアル エンクロージャー

Stromverteilung
Power Distribution
Distribution de courant
Stroomverdeling
Strömfördelning
Distribuzione di corrente
Distribución de corriente
分電・配電システム

Elektronik-Aufbau-Systeme
Electronic Packaging
Electronique
Electronic Packaging Systems
Electronic Packaging
Contenitori per elettronica
Sistemas para la electrónica
エレクトロニクス パッケージシステム

System-Klimatisierung
System Climate Control
Climatisation
Systeemklimatisering
Systemklimatisering
Soluzioni di climatizzazione
Climatización de sistemas
温度管理システム

IT-Solutions
IT Solutions
Solutions IT
IT-Solutions
IT-lösningar
Soluzioni per IT
Soluciones TI
ITソリューション

Communication Systems
Communication Systems
Armoires outdoor
Outdoor-behuizingen
Communication Systems
Soluzioni outdoor
Sistemas de comunicación
コミュニケーションシステム

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